We agree with the reviewer that the water-entry value is an important physical attribute of the soil. Let us clarify our response, as it was not very well explained. The porous medium comprises many pores, each characterized by a specific water-entry value determined by the Young-Laplace equation based on its principal radii. The shape of the main wetting branch of the retention curve is given by the combination of various pores, hence is a result of the combination of the various pore water-entry values. Consequently, this combination of water-entry values is integrated into the main wetting branch. The pores with the smallest radii determine the lowest pressure P_{low} and the corresponding lowest saturation S_{low}, marking the beginning of the main wetting branch. At the point $[S_{low}, P_{low}]$, the main wetting branch is obviously not smooth. However, our initial saturation is significantly higher than the lowest saturation S_{low}, hence the non-smoothness of the main wetting branch does not affect the results obtained. Furthermore, the stability proof of the Richards' equation, as derived in [Fürst et al., 2009], remains valid in this scenario. This is because the saturation values lie outside the interval containing S_{low}, where the main wetting branch is smooth and non-decreasing.

One might argue that even if the chosen initial saturation is above S_{low}, it would still be reasonable to define the value S_{low} in the retention curve, ensuring the model's validity for lower initial saturation. This is clearly not implemented in our model, and the retention curve satisfies $P \to -\infty$ for $S \to 0$. However, in this case, the calculated flux in the semi-continuum model equals zero.

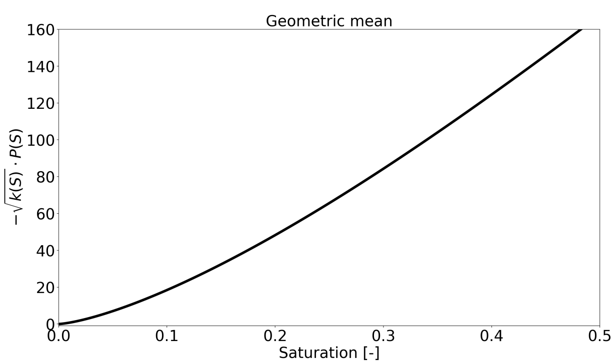
To illustrate, consider two blocks: one fully saturated ($S = 1$) and the second block with saturation decreasing towards zero. The flux between blocks is then given by equation:

$$q = \frac{\kappa}{\mu}\sqrt{k(S_1)k(S_2)}\Big(\frac{P_1(S_1) - P_2(S_2)}{\Delta x}\Big),$$

where index 1 denotes the fully saturated block, while index 2 denotes the block with the saturation decreasing towards zero. In the equation, κ and μ represent the relative permeability and dynamic viscosity, respectively, and $k(S)$ denotes the relative permeability. The pressure is determined by the van Genuchten's equation and the relative permeability is defined by equation (5) in the manuscript. Note that the fully saturated block satisfies $k(S_1) = 1$ and $P_1(S_1) = 0$. For the sake of simplicity, let's assume κ, μ and Δx are all equal to one, as these values are independent of saturation and thus does not affect the limiting process. The limit for $S_2 \to 0$ is then simplified to:

$$\lim_{S_2 \to 0} q = \lim_{S_2 \to 0} -\sqrt{k(S_2)}P_2(S_2).$$

In the figure below, the numerical limiting process is depicted using the parameters specified in the manuscript. It is evident from the figure that limit approaches zero, confirming that the flux indeed equals zero for $S_2 \to 0$.

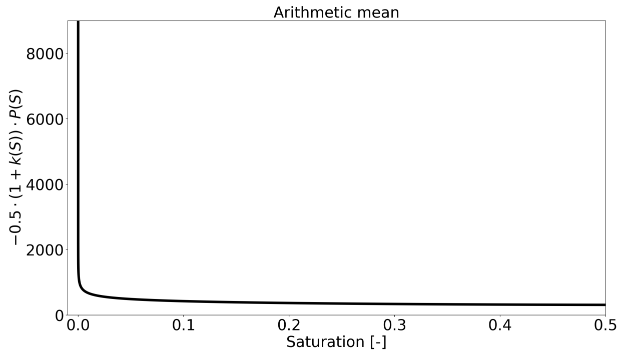


Therefore, the block with zero saturation cannot conduct the water and thus represents a hypothetical pore with zero radii. This is consistent with the reviewer's argument, as he demonstrates that for $P = -\infty$, the Young-Laplace equation yields a pore with zero radii. It's important to note that the limit equals zero only due to the application of the geometric mean of the relative permeability.

If the arithmetic mean is used instead, the limit satisfies:

$$\lim_{S_2 \to 0} q = \lim_{S_2 \to 0} -\frac{1 + k(S_2)}{2}P_2(S_2).$$

Therefore, the limit will approach infinity, as the relative permeability equals $\frac{1}{2}$ for $S_1 = 1$ and $S_2 = 0$. This is well observed in the figure below, where the numerical limiting process using the arithmetic mean is depicted.



Without the application of the geometric mean, unrealistic behavior would occur: the flux would rapidly increase as saturation decreases, which is clearly not physically correct. Additionally, the geometric mean plays a crucial role in creating the hold-back effect in the semi-continuum model. This effect occurs due to the the very low relative permeability between the blocks, which is a direct consequence of the applied geometric mean.

Finally, we would like to stress out that we find this discussion quite important, especially regarding the behavior as saturation decreases towards zero. Therefore, we plan to include into the manuscript the necessity of the geometric mean in our model in such scenarios and, as a consequence, that blocks with zero saturation represent hypothetical pores with zero radii that are unable to conduct water.